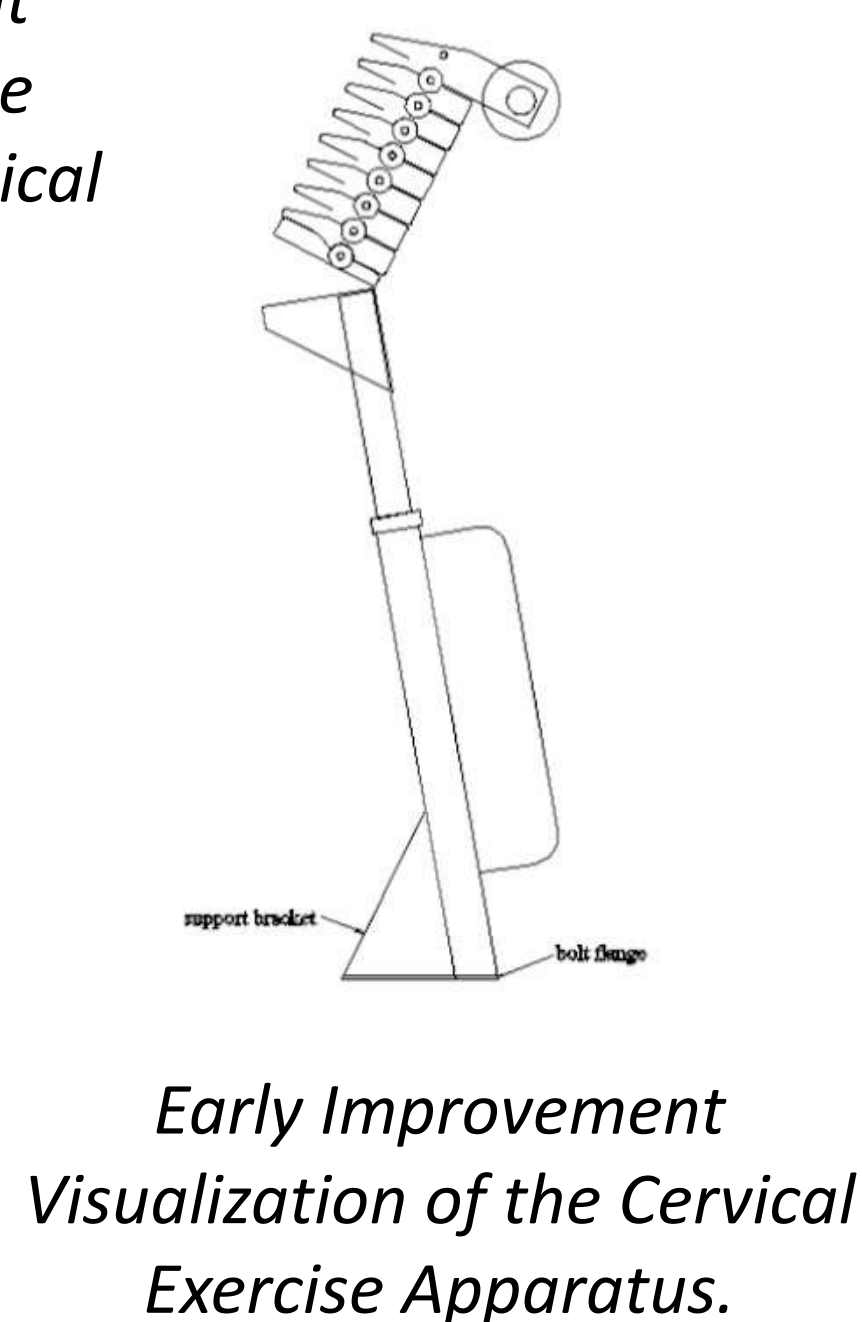
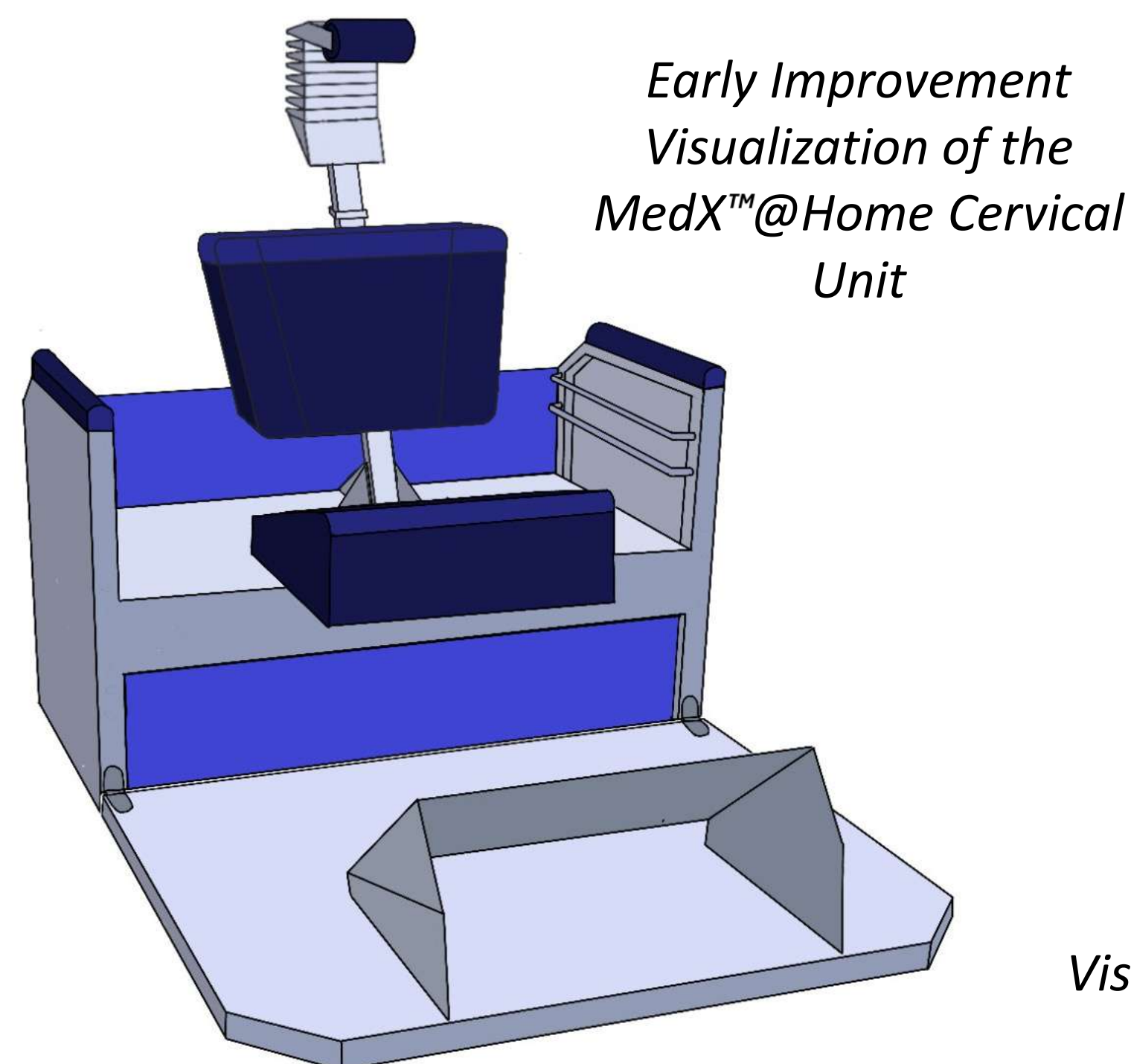


Modernization of MedX™ Rehab Medical Machines

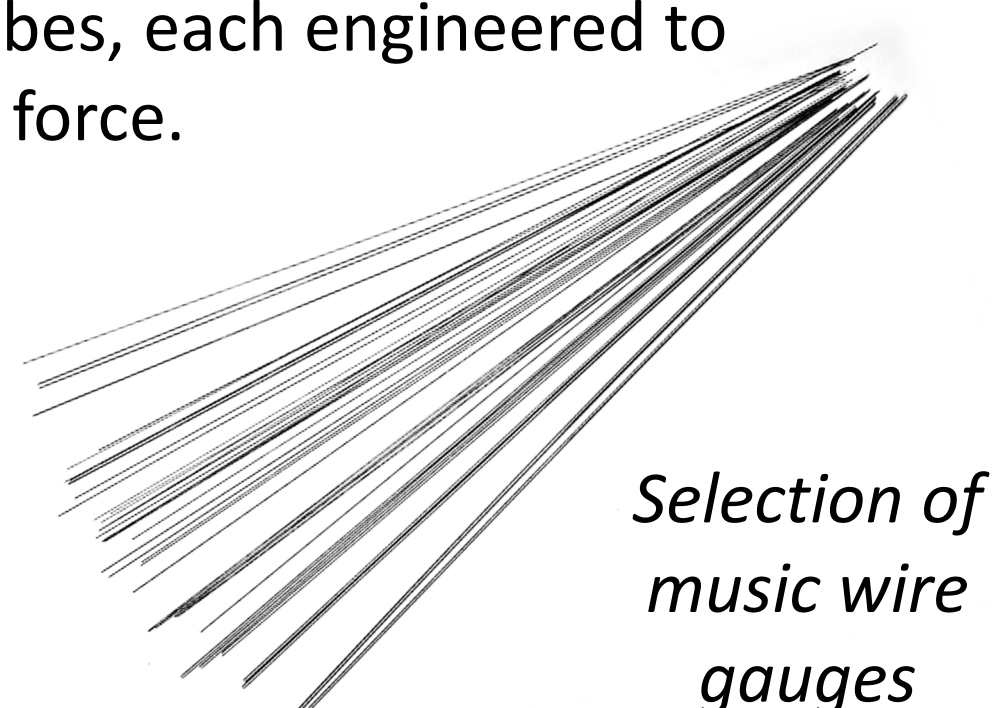
Problem Description

This project focuses on adapting the cervical extension MedX™ machine for at-home rehabilitation. In partnership with Govsphere, our team will optimize the frame, cervical resistance, and restraint systems to reduce weight, improve visual appeal, enhance the portability and ease of machine assembly, while maintaining the renowned "gold standard" clinical effectiveness of the machines. This project will help extend the reach of these high-quality rehabilitation tools and support Govsphere's mission to bring quality remote monitoring services into the homes of patients.



Resistance Mechanism Improvements

The cervical resistance apparatus will be provided by a set of interchangeable tubes that insert into a circular housing, perpendicular to the machine's vertebrae. Our team will design a custom set of wire-filled resistance tubes, each engineered to provide a specific amount of resistance force. This will be accomplished using various gauges of music wire enclosed within a tube of flexible yet durable plastic. Resistance levels will be verified using load cell testing to ensure accuracy.



Current Cervical Exercise Apparatus in Neutral (Left) and in Full Extension (Right)

Background

The original Cervical Extension Machine was developed in 1986 by MedX™ for their spine rehabilitation system. The machine has the following parameters:

- Dimensions: 63" x 48" x 66"
- Weight: 1,570 lb
- Cost: \$20,000-\$55,000



MedX™ Cervical Extension Unit

Key Design Requirements

Frame and Structure

- Weight capacity: up to 350 lb
- Transportability:
 - Fits through standard 28-inch doorframe
 - Weighs less than 40 lb per shipping box
- Assembly: simple and intuitive
- Appearance: visually appealing

Resistance

- Resistance mechanism:
 - Interchangeable tubes that are inserted along the central axis of the cervical unit
- Resistance criteria:
 - 4 to 600 lb_f of resistance in increments of 2.5 lb_f
 - Minimum of 1000 cycles without mechanical fatigue

Restraint

- Alignment System:
 - Stabilizes patient
 - Isolates targeted cervical muscles

Frame and Structure Improvements

- Enhance portability
 - Scratch prevention foam on underside of machine
 - Retractable dolly-style wheels for transportation
 - Hinge foot platform
- Add additional structural supports
 - Ribbing on underside of seat plate
 - Stiffener plate on base of the spinal support
- Simplify machine setup
 - Switch bolts for star knobs
- Improve visual aesthetics of the machine
 - Plastic façade with additional metal hand railings

Restraint Mechanism Improvements

- Improve seat pad design
- Add arm positioning handles

Semester Deliverables

- Design modifications to the MedX™@Home Cervical Unit
- Resistance load testing on the cervical apparatus
- Finite-Element Analysis (FEA) on the Cervical Unit prototype
- Machine-ready 3D CAD Drawing Package



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